

# The Interaction of Accent and *wh*-intonation in Korean and Japanese

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This paper investigates the phonetic implementations of *wh*-intonation with respect to lexical pitch accents in South Kyeongsang Korean, Tokyo Japanese and Fukuoka Japanese. It is demonstrated that *wh*-intonation in Tokyo Japanese compresses the F0 range of lexical accents inside the domain. On the other hand, the accents of the material inside the *wh*-domain are deleted completely in South Kyeongsang Korean and Fukuoka Japanese. Also, it is revealed that the implementation of prosodic scope marking is determined by the lexical pitch accent of the *wh*-phrase: pitch compression triggered by a falling tone and a high plateau triggered by a rising tone. Based on the empirical observations above, a typological generalization regarding *wh*-intonation in the three languages is provided.

**Keywords:** pitch accent, intonation, *wh*-scope, South Kyeongsang Korean, Tokyo Japanese, Fukuoka Japanese

## 1. Introduction

The prosodic marking of the semantic scope of *wh*-phrases observed in Tokyo Japanese (TJ) has recently attracted considerable attention, as its formation gives insight into the mapping process between syntax and prosody (Deguchi & Kitagawa 2002, Ishihara 2003, Kitagawa 2005, Kubo 2005, Smith 2005). The prosodic pattern which marks *wh*-scope in TJ has been termed *Focus Intonation* (Ishihara 2003, 2004) or *Emphatic Prosody* (Kitagawa 2005). As implied by these terms, the prosodic contour observed in *wh*-interrogatives has been assumed to be equivalent to the prosodic encoding of a focus based on the similarities of the two intonation patterns. Note that the intonation pattern induced by focus exhibits F0 rise of the focused item and F0 compression or reduction of the post-focus material (Pierrehumbert & Beckman 1988, Nagahara 1994, Sugahara 2003, among others). It has been widely accepted that focus features are available to the prosodic structure at the syntax-prosody interface (Selkirk 1984, Truckenbrodt 1995, Zubizarreta 1998, Büring 2006, among others). If prosodic *wh*-scope mark-

ing is indeed a kind of focus marking, the initiation of the prosodic pattern by the *wh*-phrase can be easily accounted for by assuming there is a focus feature contained in the *wh*-phrase. This obviates the need for the [wh] feature to be accessible to the interface between prosody and syntax. However, this assumption does not hold for Fukuoka Japanese (FJ) and South Kyeongsang Korean (SKK), where the comparable correlation of prosody and *wh*-scope is observed. In those two languages, *wh*-interrogatives and focus exhibit distinct prosodic patterns. Thus, I use the term *wh*-intonation to refer to the prosodic encoding of *wh*-scope in these languages.

In considering the prosodic scope marking in pitch accent languages, none of the previous studies offers instrumental data to address the issues of the interaction between the accent of *wh*-phrases and *wh*-intonation. Additionally, cross-linguistic comparison is quite limited. Thus, the two main goals of this study are: first, to explicate the phonetic implementation of the prosodic scope marking with respect to pitch accents and, second, to generalize the patterns of *wh*-intonation in the three languages. Specifically, the following questions are addressed. First, I examine how lexical accents surface inside the domain of *wh*-intonation by consulting prior work and by undertaking an experiment. Second, I consider the interaction between the accents of *wh*-phrases and the prosodic scope marking, focusing on the distinct patterns of *wh*-intonation in the languages under investigation. Third, based on the observed characteristics, I attempt to provide a typological generalization for the prosodic marking of *wh*-scope. The careful study of the prosodic scope marking in this study reveals an important generalization about the nature of *wh*-intonation, offering implications for the interface of phonology and syntax.

This paper is structured as follows. I present fundamental aspects of the prosodic structure in TJ, FJ and SKK (§2). In §3, I review the previous research on the prosodic marking of *wh*-scope in TJ and FJ that are relatively well studied compared to SKK in this regard. In §4, I provide instrumental data to test the issue of complete deaccenting, the phonetic implementation of *wh*-intonation in SKK. Based on the observations in the previous sections, I provide some generalizations about the surface realization of *wh*-intonation in the three languages and propose a phonological representation in §5. I conclude this paper in §6.

## **2. Prosodic Structure of Tokyo & Fukuoka Japanese and South Kyeongsang Korean**

It is widely assumed that there are two tones, H(igh) and L(ow), in Japanese (Kubozono 1988, Pierrehumbert & Beckman 1988, among others).

Lexical items which exhibit a pitch fall (H\*+L) are referred to as *accented*, otherwise as *unaccented*. Given that a wh-phrase in both TJ and FJ is lexically accented, *dáre* ‘who’ or *náni* ‘what,’ the effect of accentedness on the F0 of the following material is crucial for our discussion.

FJ refers to the variety of Japanese which is spoken in the area surrounding the city of Fukuoka, in the northwestern part of Kyushu. It is widely acknowledged that the overall prosodic system is largely similar to that of TJ in various aspects (Hayata 1985, Kubo 1989). Unlike TJ, however, adjectives and verbs in FJ are obligatorily accented, and the location of the accent is fixed on the penultimate syllables (Hayata 1985). Since accentedness is contrastive only for nouns, adjectives and verbs in FJ are more restricted in terms of their accentual pattern. More importantly, wh-phrases in FJ exhibit a falling tone in isolation as they do in TJ but are realized with a rising tone in wh-questions (Kubo 1989).

Let us turn to the accent system in SKK. While there is consensus that SKK, along with North Kyeongsang Korean, is a pitch accent language (Ramsey 1978, K Chung 1980, J Jun et al. 2006, Kenstowicz & C Park 2006, S-E Chang 2007), the lexical accent groups and their particle-dependent alternation in this variety of Korean have not been fully clarified in the previous literature. Yet, there is general consensus that there are three distinctive accent classes for monosyllabic words (W Huh 1954, C-G Gim 1978, Ramsey 1978, S-E Chang 2007, Utsugi 2009); these are labeled intuitively as H(L), H(H) and L(H) in the current study.<sup>1</sup> An example of each class and its accent alternation in derived forms are given below. A low and rising tone are marked with a grave ( ` ) and a hacek ( ˇ ), respectively. The tones in parentheses indicate those of the following case markers.

(1) Three accent classes of monosyllabic words in SKK

a. H(L):	mwún	‘door’	mwún-ì	‘door-Nom’
b. H(H):	nwún	‘eye’	nwún-í	‘eye-Nom’
c. L(H):	nwŭn	‘snow’	nwùn-í	‘snow-Nom’

A monosyllabic word belonging to the first group exhibits an H tone in the initial syllable followed by an abrupt F0 fall.<sup>2</sup> This is extremely similar to the

<sup>1</sup> Different claims have been made regarding contrastive tones of monosyllabic words in SKK: H, L and M(id) tone by W Huh (1954) and C-G Gim (1978) based on auditory impression, two atonic and a preaccent group by Ramsey (1975) grounded on historical facts and tone alternation, H, M and R by S-E Chang (2007) based on empirical data, or H and L by K Chung (1980), M-O Choi (1998), and D Lee and Davis (2009) parallel to NKK.

<sup>2</sup> When a consonant-initial polysyllabic particle follows, a high tone is observed in the second syllable, as in *mwun-póda* ‘door-than’ (Ramsey 1975, M J Kim 1996, S-E Chang 2007). This behavior has been explained by the assumption that a consonant-initial polysyllabic particle bears an H tone on the first syllable while a vowel-initial suffix and a consonant-initial monosyllabic particle are toneless. See MJ Kim (1996) for further discussion.

accent pattern of an item in the second group in citation. In fact, if produced in isolation, segmentally identical words of the two groups are not distinguishable. A crucial difference between the groups lies in the tone alternation; a particle following an item of the second group is realized as high resulting in a H(H) pattern. This unusual pattern has been named as preaccent (Ramsey 1978), double H (Kenstowicz & H-S Sohn 2001) or doubly linked H (J Jun et al. 2006). The last class shows a rising pitch pattern in isolation. Yet, when followed by a particle, an H tone is observed not in the root, but in the particle.

Turning to disyllabic words in SKK, there are four different classes depending on the tone alternation pattern (Ramsey 1975, S-E Chang 2007).

(2) Four accent classes of disyllabic words in SKK

a. HL(L):	ánay	‘wife’	ánay-ka	‘wife-Nom’
b. HH(L):	nálgáy	‘wing’	nálgáy-ka	‘wing-Nom’
c. LH(H):	angáy	‘fog’	angáy-ká	‘fog-Nom’
d. LH(L):	talí	‘bridge’	talí-ka	‘bridge-Nom’

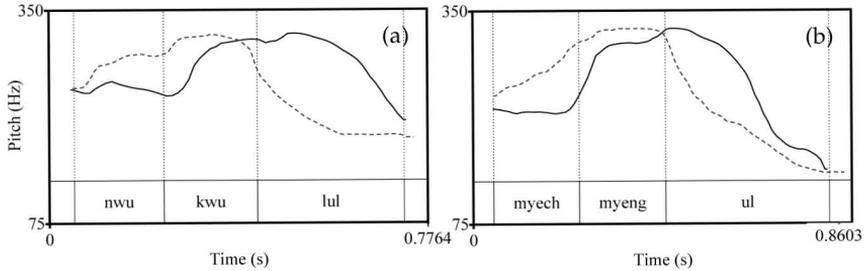
Again, class LH(H) and LH(L) are not perceptually distinguishable when produced in isolation. This seemingly unusual distinction has different tonal origins in Middle Korean: LH(H) from RH or RL and LH(L) from LL tones (Ramsey 1975, Kenstowicz & C Park 2006).

Given the accent classes above, let us look at the accent patterns of wh-phrases in SKK. Recall that wh-phrases in Japanese bear H\*+L tones. In SKK, on the other hand, wh-phrases generally exhibit L(H) for a monosyllabic wh-phrase or LH(H) pitch pattern for a polysyllabic one. Yet, I observe that two wh-phrases *myeoch* ‘how many’ and *nwukwu* ‘who’ allow alternating accent patterns L(H)~H(H) and LH(H)~HH(L), respectively.

(3) Lexical accent patterns of wh-phrases in SKK

a. nwúkwú~nwukwú	‘who’	b. mwués	‘what’
c. encéy	‘when’	d. etisé	‘where’
e. ettéhkéy	‘how’	f. wěy	‘why’
g. myěch~myéch	‘how many’		

Sample F0 tracks of the pairs in (3a) and (3g) are illustrated below, which were produced in isolation by the author. For an easier comparison, the accusative marker *-(l)ul* follows the wh-phrases. As the wh-phrase *myech* requires a classifier in most usages, the classifier for people *-myeng* is attached to *myech*. The coda /ch/ of this item is nasalized by the following /m/ of the classifier. The LH(H) tone is drawn with a solid line and the HH(L) tone with a dashed line.



**Figure 1.** F0 contours of accent alternation: (a) *nwukwu-lul* (b) *myech-myeng-ul*.

In Figure 1(a), the F0 of LH remains low throughout the first syllable. It starts rising and reaches a peak in the second syllable, and remains high in the middle of the vowel in the accusative marker. On the other hand, the F0 of HH demonstrates higher start, earlier rising and abrupt fall in the accusative marker. Figure 1(b) shows a similar contrast. Interestingly, I observe that the phonetic implementation of wh-intonation in this variety is determined by the lexical accent of wh-phrases: while the high plateau pattern follows a rising tone, the F0 compression pattern is observed in the material following a falling tone.

With respect to prosodic phrasing, the prosodic constituents that are particularly relevant for this study are the *Major Phonological phrase* (MaP) and the *Minor Phonological Phrase* (MiP). A MiP is the domain of initial lowering (Poser 1984, Kubozono 1988, Pierrehumbert & Beckman 1988, Selkirk & Tateishi 1988, Sugahara 2003). At most one accent can occur in a MiP. On the other hand, a MaP is characterized by two intonational phenomena: *downstep* and *pitch reset* (Poser 1984, Pierrehumbert & Beckman 1988). It has been convincingly argued that an F0 peak of material following an accented word is noticeably lower than that following an unaccented word (Poser 1984, Kubozono 1988, Pierrehumbert & Beckman 1988, Nagahara 1994). This compression of the pitch range produced by preceding accented items is called *downstep* (Kubozono 1988, Selkirk & Tateishi 1991). At the left edge of a new MaP, the compressed pitch range is expanded with a blocking of the prior downstep, which is referred to as *pitch reset*. In other words, pitch reset signals a new MaP. Notice that both the MaP and the MiP are defined in terms of F0 excursion size indicating that it is not possible to diagnose the presence or absence of phrasing independently from F0 excursion size.

In FJ, it is known that phrasing is similar to that of TJ (Hayata 1985). Thus I assume the same prosodic framing and phonetic cues for the MaP or the MiP in TJ can be employed to identify the presence or absence of a phrase boundary in FJ.

In SKK, due to the lack of prior research on prosodic phrasing, I intro-

duce a study where the phrasing of North Kyeongsang Korean, which is very similar to SKK with respect to prosodic structure, was examined. J Jun et al. (2006) argue that while the Intonational Phrase (IP) in NKK is indicated by final lengthening and a boundary tone, the Intermediate Phrase (ip) is indicated by downstep. It seems that an Intermediate Phrase in NKK corresponds to a MaP in Japanese in that both are characterized by the same intonational phenomenon, namely downstep. In fact, this level of phrase has been referred to with various names even in Japanese including the term *Intermediate Phrase* (Pierrehumbert & Beckman 1988): MaP in McCawley (1968), Shibatani (1972), Poser (1984), *Voicing Unit* in Fujisaki and Sudo (1971), *Intonational Phrase* in Miyara (1981). Thus, I employ the term *MaP* for all the languages at issue.

### 3. *wh*-intonation in Two Varieties of Japanese

In this section, I introduce research on *wh*-intonation in TJ, which has been the most extensively studied among the languages at issue, at least in impressionistic terms. I first review two different accounts to define *wh*-intonation either as a domain of F0 compression (Deguchi & Kitagawa 2002, Ishihara 2002, 2003, Kitagawa 2005) or as prosodic phrasing (Hirotani 2005), before discussing the issue of equating *wh*-intonation and focus prosody.

#### 3.1. Tokyo Japanese

Distinct intonational characteristics of *wh* and non-*wh* interrogatives in TJ were first recognized by Maekawa (1991). In comparing the F0 contours of *wh* and non-*wh* interrogatives, he observed that the F0 peak of a *wh*-phrase is higher than that of its non-*wh* counterpart, and that of the predicate is lower in *wh*-interrogatives. Based on these characteristics, Maekawa noted that, impressionistically, the focus of a *wh*-question is on the *wh*-phrase while that of a non-*wh* question is on the predicate. However, he did not capture the correlation between intonation and the scope of a *wh*-phrase as he tested only simple mono-clausal interrogatives.

Tomioka (1997) first captured the correlation between prosody and *wh*-scope. Also, Deguchi and Kitagawa (2002) and Ishihara (2002) independently reported that the right edge of the post-focal F0 compression correlates with the scope of a *wh*-phrase and they further documented the phenomenon (Ishihara 2003, 2004; Kitagawa 2005, 2007). A representative example of *wh*-phrases taking distinct scope in TJ is given below, taken from Ishihara (2003). *Wh*-phrases and their semantic scope are represented by **boldface**

and shading, respectively.<sup>3</sup>

- (4) Naoya-wa [Mari-ga nani-o nomiya-de nonda-ka]  
 Naoya-Top Mari-Nom what-Acc bar-Loc drank-Comp2  
 imademo oboeteru-ø?  
 even.now remember-Comp1

- a. ‘Does Naoya still remember what Mari drank at the bar?’  
 [CP1 [CP2 **wh** Comp2] Comp1]
- b. ‘What1 does Naoya still remember whether Mari drank *t*1 at the bar?’  
 [CP1 [CP2 **wh** Comp2] Comp1]

The embedded wh-phrase takes either embedded scope (4a) or matrix scope (4b)<sup>4</sup>, depending on which Comp it is associated with. Prosodically, the right edge of wh-intonation aligns with the right edge of the scope of the wh-phrase. Pitch contours of the two interpretations in (4), produced by Ishihara, are shown below. Arrows and shading indicate the location of wh-phrases and the domain of pitch compression, respectively.

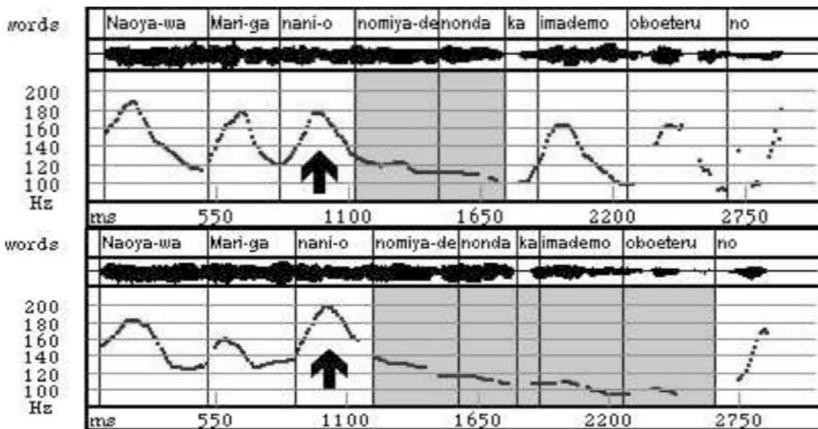


Figure 2. Pitch contours of the interrogatives with embedded (top) and matrix (bottom) wh-scope (Ishihara 2003: 61).

<sup>3</sup> Abbreviations for functional categories glossed in this paper are as follows: Comp-complementizer, CP-complementizer phrase, Nom-nominative, Acc-accusative, Loc-locative, TOP-topic, Q-interrogative ending, Neg-negative.

<sup>4</sup> Some speakers might not accept the matrix-scope reading in (4b), which violates the wh-island effect. See Kitagawa (2005) for possible factors yielding the varying judgments on this construction.

As shown in (4) and Figure 2, the two contours exhibit quite similar patterns until the Comp *-ka*. Striking differences are observed in the F0 of the material following the embedded Comp where the compression is either terminated (in the top contour) or continued (in the bottom contour). Notice that the right edge of the domain of F0 compression aligns with the right edge of the *wh*-scope, indicating a correlation between the two. Observing this pattern, Deguchi and Kitagawa (2002) and Ishihara (2002, 2003) claim that *wh*-intonation in TJ corresponds to the domain of pitch compression. It should be noted that the realization observed in the post-*wh* material in TJ is F0 compression rather than deaccenting (Deguchi & Kitagawa 2002, Ishihara 2002, Hirotnani 2005). We will see that while this view involving F0 compression adequately describes the observed prosodic pattern of *wh*-interrogatives in TJ, it cannot be readily extended to FJ and SKK where the comparable scope marking surfaces as a high flat pitch pattern.

Turning to the phrasing account, Hirotnani (2005) and Richard (2006) follow the tradition that a focus modifies phrasing rather than F0 excursion size (Nagahara 1994, Truckenbrodt 1995, Uechi 1998, Selkirk 2000). Hirotnani (2005) argued that, like focus-prosody, *wh*-intonation in TJ corresponds to a Major Phrase (MaP) based on the claim that a focus creates a MaP boundary on its left edge and deletes following MaP boundaries (Pierrehumbert & Beckman 1988). See Figure 2 that the F0 expansion of *wh*-phrases and F0 compression of post-*wh* items signal the lack of MaP boundaries inside the *wh*-scope. A new MaP boundary is created after the *wh*-scope in the upper track, exhibiting the F0 reset of post-Comp material. The prosodic *wh*-scope marking in TJ can be well accounted for by this view involving phrasing manipulation. Also, this view has advantages over the F0 compression view in that it can be easily extended to describe similar phenomena in a great number of languages (Kubo 2005, Richard 2006, Smith 2011). Indeed, *wh*-intonation in FJ has recently been argued to be the formation of a single phrase (Kubo 2005, Richard 2006, Smith 2011), a view which will be further discussed in the following section.

### 3.2. Fukuoka Japanese

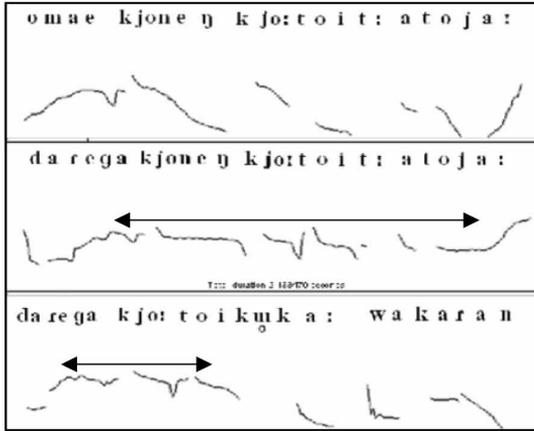
For an investigation into prosodic scope marking, FJ appears to be particularly instructive since the prosodic pattern of *wh*-scope marking in this variety of Japanese is specific to *wh*-intonation. In this section, I introduce impressionistic descriptions and generalizations of *wh*-intonation in FJ primarily based on the work by Hayata (1985) and Kubo (1989).

FJ exhibits prosodic marking of *wh*-scope similar to TJ, but with important differences. The prosodic scope marking in FJ was first described by Hayata (1985), and extensively examined in various constructions by Kubo

(1989, 1993). Kubo (1989) describes this intonation pattern as follows: a prosodic constituent is formed from a wh-element to the Comp that binds the wh-element. It consists of a rise during the wh-element followed by a high flat interval with a fall at the end. Further, the phonetic implementation of wh-intonation in this variety of Japanese is rather exceptional in that it has been claimed that lexically specified pitch accents are completely lost in the domain of wh-intonation. The only exception is a penultimate accent in an indirect wh-question (Hayata 1985, Kubo 1989, Smith 2005). Examples of a yes/no question, a direct and an indirect wh-question, taken from Kubo (1989), are given below.

- (5) a. yes/no question  
 omae kyó-nen Kyóoto itta toya-ø  
 you last-year Kyoto went ending-Comp[-wh]  
 ‘Did you go to Kyoto last year?’
- b. direct wh-question  
**Dare-ga** kyo-nen Kyooto itta toya-ø  
 Who-Nom last-year Kyoto went ending-Comp[+wh]  
 ‘Who went to Kyoto last year?’
- c. indirect wh-question  
**Dare-ga** kyooto ikú-ka wakar-án  
 Who-Nom Kyoto go-Comp[+wh] know-Neg  
 ‘I don’t know who is going to Kyoto.’

According to Kubo (1989), it is predicted that the yes/no question in (5a) does not yield any special intonation pattern, exhibiting a pitch contour greatly resembling that in TJ. On the other hand, the wh-questions in (5b) and (5c) are expected to show a high flat pitch contour whose right edge is aligned either with the matrix Comp (5b) or with the embedded Comp (5c). Smith (2005) provides pitch contours for these examples, which are presented in Figure 3. Arrows added by the author indicate the domain of the high flat pattern.



**Figure 3.** Pitch contours of a yes/no question (top), direct wh-question (middle), and indirect wh-question (bottom) in FJ (Smith 2005: 222-223).

As the original examples contain voiceless consonants, local pitch perturbations are observed. Yet, as expected, Figure 3 illustrates an implementation of ordinary pitch accents for the yes/no question (top) and the high plateau pattern for the direct wh-question (middle). The abrupt F0 fall on the embedded Comp of the indirect wh-question (bottom) implies that a default accent is assigned to the penultimate mora of the embedded clause in (5c). Based on observations like these, Hayata (1985) and Kubo (1989) argue that the default tonal shape of wh-intonation is LH for direct wh-questions, and LH\*L for indirect wh-questions.

Since wh-intonation is realized as a high plateau in this variety, there is no issue as to whether it is prosodic phrasing or F0 compression as in TJ. Instead, it is reasonably referred to as a prosodic phrase with a final boundary tone aligned with Comp where the relevant wh-phrase takes scope. Recently, Kubo (2005) has proposed that wh-intonation in FJ is a single MiP based on the prosodic characteristics of wh-intonation in accordance with those of the MiP. A MiP is defined as the domain of initial lowering and it permits at most one accent. The distinct level of prosodic phrase argued for wh-intonation in TJ and FJ—MaP for TJ and MiP for FJ—results from the language/dialect-specific implementation of prosodic scope marking.

The most striking observation about wh-intonation in FJ is that no F0 rise or fall appears inside the domain of the high plateau, suggesting complete deaccenting. This exceptional characteristic in FJ is highly significant as it enables us to distinguish wh-intonation from the F0 rise or compression triggered by other discourse associated factors such as a focus, *discourse-newness*, or *givenness*. However, only Smith (2007) tested this claim experimentally. She compared the F0 fall of both accented and unaccented items in either

yes/no questions or wh-questions. The results showed that accented items in wh-questions (A-wh) pattern together with unaccented items (U) in terms of the average F0 fall, whereas accented items in yes/no questions (A-yes/no) exhibit a significantly greater F0 fall than items in the other conditions. These production data reveal that lexical pitch accents are entirely absent in the domain of wh-intonation.<sup>5</sup>

(6) A-wh, U-wh, U-yes/no  $\ll$  A-yes/no

It is worth reiterating that this high flat tonal contour which is specific to wh-intonation makes it possible to prosodically distinguish wh from other discourse/pragmatic patterns. In the following section, we turn to wh-intonation in SKK, which is the most robust case.

#### 4. *wh*-intonation in South Kyeongsang Korean

##### 4.1. Previous Studies

Among the languages under discussion, the least attention has been paid to SKK with regards to wh-intonation. C-G Gim (1970) first observes the particular pitch pattern in wh-interrogatives and impressionistically describes it as a tonal change of post-wh material. Specifically, he notes that all underlying tones following a wh-phrase change to H tones.

(7) Example from Gim (1970)

M H    H H    H H H H M  
**o tey** ka-se kukes-ul sass-no  
 where go-and that-Acc bought-Comp  
 'Where did you go and buy that?'

Gim (1970) assumes that SKK is a tone language where three underlying tones H, M, and L are contrastive. Based on the observed pattern, he proposes a rule that the tonal contour of wh-questions becomes MH<sub>*n*</sub>M where *n* is the number of syllables between the initial syllable of a wh-phrase and the question ending. However, he does not capture the nature of the 'tonal change', that is the prosodic scope marking, as he imposed no restrictions on the right edge of the process. Consequently, ill-formed intonation patterns are created for indirect wh-questions. Moreover, this rule is not sufficiently

<sup>5</sup> See Smith (1999) and HK Hwang (2011) who report a recent change-in-progress with regard to the lack of accent loss among young speakers of FJ.

well motivated. The exceptional prosodic pattern in SKK as an indication of *wh*-scope, and the striking similarities with *wh*-intonation in FJ are first captured by Kubo (1993). In examining various interrogative constructions in SKK, Kubo also points out that there is no restriction in length for the high plateau. An example is presented below.

(8) Unrestricted length for the high plateau (Kubo 1993)

**nwu-ka** onul Chelswu-hako Yenghui-ka yekpwuro  
 who-Nom today Chelswu-and Yenghui-Nom on.purpose  
**Taykwu-ey** kanta-ko ni-hanthey malhayss-no?  
 Taeku-Loc be.going-that you-to told-Comp  
 ‘Who told you that Chelswu and Yenghui are going to Taeku on purpose today?’

Although Kubo (1993, 2005) provides insightful observations on *wh*-intonation, an instrumental examination has yet to be done for this variety of Korean. Thus, I collected acoustic data for SKK in which minimal pairs (with respect to semantic scope) of *wh*-questions were recorded, carefully controlling for segmental context. Phonetic descriptions of *wh*-intonation in this variety of Korean are discussed in the following section.

4.2. Phonetic Description of *wh*-intonation in South Kyeongsang Korean

Recordings were made using items which do not contain aspirated or tense obstruents. The recorded interrogatives and predicted domain of the high plateau are presented in (9).

(9) a. embedded scope

Minho-nun Yumi-ka **nwukwu-lul** mannassnun-ci  
 Minho-Top Yumi-Nom who-Acc met-Comp[+wh]  
 kwungkumhayha-na?  
 wonder-Comp[-wh]

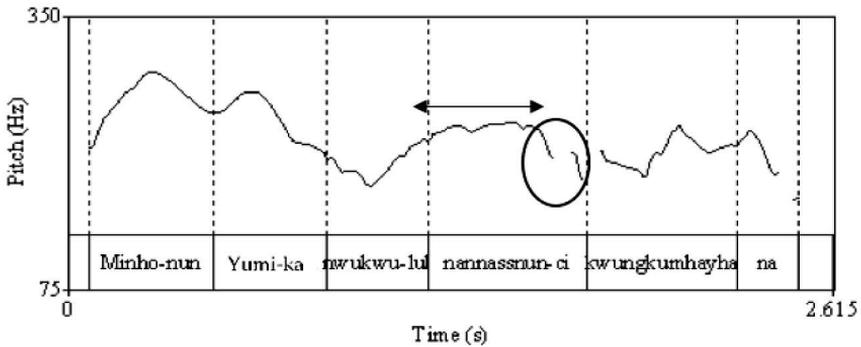
‘Does Minho wonder who Yumi met?’

b. matrix scope

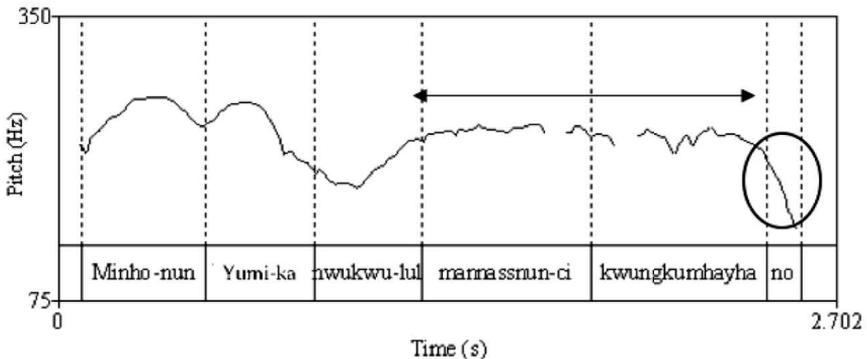
Minho-nun Yumi-ka **nwukwu-lul** mannassnun-ci  
 Minho-Top Yumi-Nom who-Acc met-Comp[-wh]  
**kkwungkumhayha-no?**  
 wonder-Comp[+wh]

‘Who1 does Minho wonder whether Yumi met t1?’

The final question endings *-na/-no* are morphological scope markers; *-na* for embedded scope and *-no* for matrix scope. Except for the final question ending, the two sentences are identical at the segmental level. The pitch contours of the interrogatives above are presented in Figure 4 and in Figure 5. Both were uttered by a female speaker of SKK who was in her early twenties at the time of the recording. The high plateau and the falling boundary tone are indicated by arrows and circles, respectively.



**Figure 4.** Wh-intonation of the high plateau pattern for an indirect wh-interrogative in SKK.

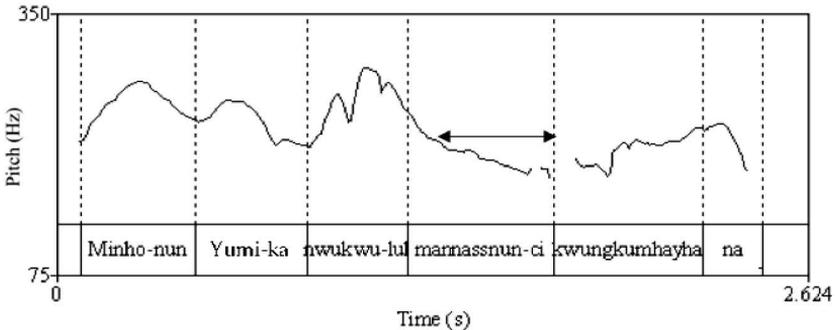


**Figure 5.** Wh-intonation of the high plateau pattern for a direct wh-interrogative in SKK.

As graphically shown above, the right edge of the high flat F0 contour aligns with the Comp that the wh-phrase is associated with. Also, the right edge of the high plateau is marked by a discrete falling tone regardless of wh-scope. Notice that up until the falling boundary tone on the embedded Comp in Figure 4, the overall pattern of the two contours is almost identical. As in FJ, no clear sign of accent fall is observed inside the domain of wh-

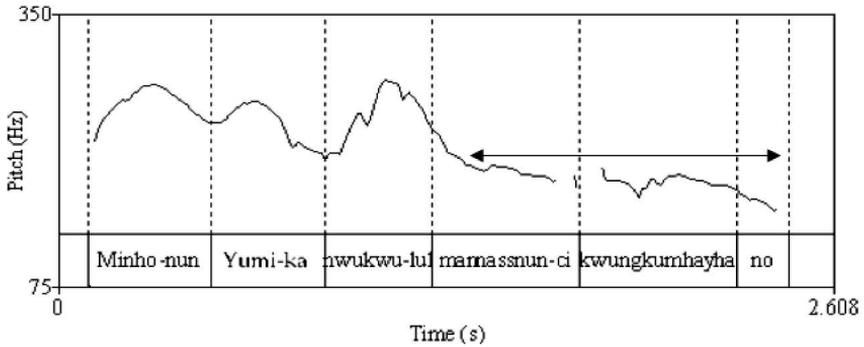
intonation.

In considering the phonetic implementation of prosodic scope marking in SKK, the following question arises: does the tone alternation of a wh-phrase influence the implementation of wh-intonation? The wh-phrases demonstrated above are realized with a rising tone as in FJ. Yet, recall that the interrogative words *nwukwu* 'who' and *myech* 'how many' in SKK bear alternating accent patterns LH(H)~HH(L). While Kubo (1993) notes that, intuitively, the falling accent pattern is emphatic, I found that both patterns can be used even in the same situation by a single speaker.<sup>6</sup> If these wh-phrases are produced with a falling tone, does the pitch rise again to form a high plateau? Or do we observe F0 compression following the falling tone? Pitch contours of the same wh-questions in Figure 4 and 5 where the wh-phrases exhibit a falling tone are presented below. These questions were produced by the same speaker who uttered the sentences in Figure 4 and 5.



**Figure 6.** Wh-intonation of the F0 compression pattern for an indirect wh-interrogative in SKK.

<sup>6</sup> There was a preference for one accent pattern over the other, the direction of preference depending on the speaker. Whereas two speakers among the four I recorded consistently used the rising pattern yielding the high plateau contour, the other two used the falling tone for *nwukwu* 'who' except for a few tokens.



**Figure 7.** Wh-intonation of the F0 compression pattern for a direct wh-interrogative in SKK.

Interestingly, if these interrogative words are uttered with a falling tone, F0 compression, and not the high plateau, results. In comparing the contours in Figure 6 and 7, notice that the difference is observed in the F0 peaks of the matrix verbs: the F0 peak of the matrix verb in the direct wh-interrogative in Figure 7 is substantially compressed. It should be noted that this pattern is comparable to the phonetic manifestation of wh-intonation in TJ. This finding suggests a generalization about the realization of wh-intonation: the implementation of prosodic scope marking is actually accent-dependent.

A similar kind of interaction between tone and intonation has been reported for the intonation pattern triggered by focus in SKK (J Kim & S-A Jun 2009) and North Kyeongsang Korean (Y Chung 1991, Kenstowicz & H-S Sohn 1997, J Jun et al. 2006, H-S Lee 2008); if an element bearing a falling tone is focused, the F0 of the element is raised and F0 compression follows on the post-focus material. On the other hand, if a focused element bears a non-falling tone, F0 not of the focused element but of the following non-focused one is raised. This asymmetrical focus realization implies that distinct prosodic patterns that depend on tone type are not limited to the prosodic marking of wh-scope.

In this section, the tone-dependent phonetic implementation in SKK has been discussed. Yet, the issue of deaccenting inside the wh-intonation span in SKK still remains to be instrumentally investigated. It is important to confirm this characteristic of the language because it enables us to prosodically discern prosodic wh-scope marking from the phonetic encoding of information status. Thus, I performed a perception test to investigate the claim of deaccenting in the domain of wh-intonation in SKK. The methodology of the perception test and implications of the results are discussed in the following section.

### 4.3. Perception test in South Kyeongsang Korean

In exploring prosodic scope marking in SKK parallel to that in FJ, Kubo (1993) claims that complete neutralization of tone contrast occurs inside the domain. As experimental data to support the claim have yet to be available, I conducted a perception test to ascertain whether total accent loss indeed occurs in SKK.

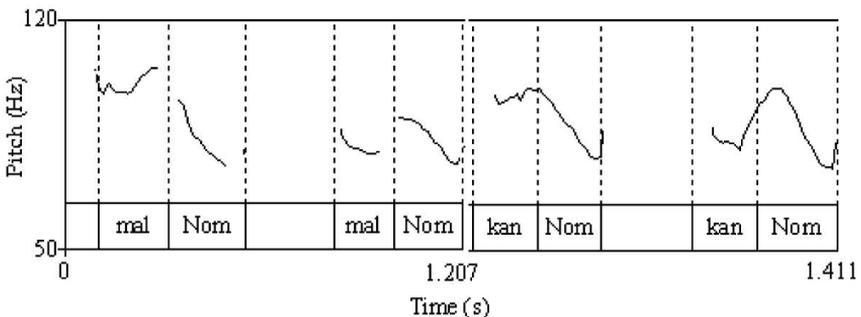
#### 4.3.1. Stimuli and Predictions

Two sets of tonal minimal pairs and three intonation patterns were tested. The lexical accent types and the glosses of the two pairs are presented in Table 1.

**Table 1.** Tested tonal minimal pairs.

	accent	gloss
mal	H(L)	horse
	L(H)	speech
kan	H(H)	saltiness
	L(H)	liver

Pitch contours for the pairs above, produced in isolation by a male speaker of SKK in his late twenties, are presented in Figure 8. The nominative marker *-i* follows as the tonal contrast is observed more clearly in this environment. The contours represent H(L) and L(H), respectively, for *mal* in the left panel, and H(H) and L(H) for *kan* in the right panel. The short discontinuities in the left panel are caused by the lateral in the coda position as it undergoes intervocalic flapping.



**Figure 8.** F0 contours of tonal minimal pairs followed by a nominative marker: HL-R for *mal* (left) and HH-R for *kan* (right).

The left-hand contours in each panel start at quite a high pitch. The one in the left-hand panel (HL) reaches its peak at the end of the first syllable and falls abruptly at the onset of the second syllable, whereas the one in the right-hand panel (HH) displays an F0 peak that remains high until the beginning of the second syllable. Both contours in the right side of each panel exhibit a gentle rise toward the second syllable, reaching a peak in the second syllable followed by a falling tone.

Each item was embedded either in a declarative or in an indirect wh-interrogative. For the wh-interrogative, *nwukwu* ‘who’ was employed as it exhibits both types of wh-intonation. Wh-intonation with F0 compression and declaratives with no wh-intonation were included as a control group. The carrier sentences are given below with the target minimal pair underlined.

(10) Carrier sentences

- a. Nami-nun [Namho-ka mal-i te  
Nami-Top Namho-Nom Target-Nom more

manhun-ci] mwul-ess-ta  
plenty-Comp[-wh] ask-Past-Dec

‘Nami asked whether Namho is more talkative/has more horses.’

- b. Nami-nun [nwu-ka mal-i te  
Nami-Top who-Nom Target-Nom more

manhun-ci] mwul-ess-ta  
plenty-Comp[+wh] ask-Past-Dec

‘Nami asked who is more talkative/ has more horses.’

Unlike declaratives (10a), indirect wh-questions (10b) are expected to exhibit either the high plateau pattern or F0 compression pattern, depending on the accent type of the wh-phrase. Notice that the target minimal pair is located inside the domain of wh-scope in (10b). Thus, if wh-intonation is implemented as a high plateau, it is predicted that the tonal minimal pairs will lose their lexical accents and be completely neutralized. In contrast, in the domain of F0 compression, or in declaratives that do not yield wh-intonation, the tonal contrast of the target pairs will be preserved. Intonation patterns of carrier sentences and predictions are summarized in Table 2.

**Table 2.** Summary of prosodic conditions and predictions.

	accent of wh	wh-intonation	prediction
declaratives		absent	contrastive
wh-interrogatives	Falling	compression	contrastive
	Rising	high plateau	neutralized

Two accent types of the target pairs, two tonal pairs (*mal* & *kan*), and three intonation types yielded twelve combinations ( $2 \times 2 \times 3 = 12$ ).

#### 4.3.2. Recording

Two (one male and one female) native speakers of SKK participated in the recordings. They were born and raised in the South Kyeongsang region (in the city of Changwon for the male subject and in the city of Jinju for the female subject). The male and female speakers were twenty-eight and twenty-one years old, respectively, at the time of recording.

The recordings were conducted in a quiet location at one of the subjects' home. A portable Marantz digital recorder (PMD 660) and a SHURE SM 57 microphone were used for the recordings. A script was given to each subject that contained test sentences in Korean orthography. Situations that facilitate each reading of the minimal pairs were not included in the script. Instead, I provided the context for each test sentence verbally. Subjects were instructed to listen carefully to the context given, and to read the test sentence accordingly. Each speaker read the script twice at a comfortable speed. The second renditions were used as the stimuli for the perception test since they were more naturally uttered. For wh-questions, both speakers consistently produced the wh-phrase with a rising tone, resulting in the high plateau pattern. As it was also necessary to obtain wh-intonation of the F0 compression pattern, I asked them to utter the wh-phrase with a falling tone after confirming that it is natural for both of them. As expected, the falling tone of the wh-phrase yielded not the high plateau but the F0 compression pattern for prosodic wh-scope marking. At the recording session, a total of twenty four (12 stimulus type  $\times$  2 speakers) stimuli were created.

#### 4.3.3. Procedure

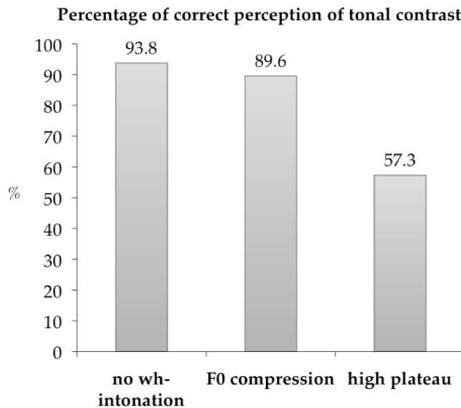
Twelve (seven male and five female) native speakers of SKK in their twenties or early thirties participated in the perception test. All were born and grew up in the South Kyeongsang region.

The stimuli were randomized and presented in the same order to all participants. Participants were asked to double-click on the sound icon of each stimulus, and to listen to each stimulus twice. It was a forced-choice test, and the choices were presented in a text. Categories or synonyms for each mean-

ing were given as choices to distinguish the homophones: *mal* ‘horse’ and *mal* ‘speech’ were discriminated by the labels ‘animal’ and ‘language’, respectively. For *kan*, ‘liver’ and ‘saltiness’ were discriminated by the labels ‘organ’ and ‘seasoning’, respectively. The perception test was conducted either in a quiet classroom or in an office at Changwon National University.

#### 4.3.4. Results

A total of 288 responses were collected (24 stimuli  $\times$  12 participants). Overall, subjects clearly distinguished the tonal minimal pairs when the test words appeared either with no wh-intonation or with the compression pattern following an accented wh-phrase. The absence of wh-intonation (in declaratives) and F0 compression conditions yielded 93.8% and 89.6% accuracy, respectively. The average percentages of correct responses are graphically presented in Figure 9.



**Figure 9.** Mean percentages of correct perception of tonal contrast depending on intonation patterns for all listeners.

This high level of accuracy when wh-intonation is absent is not surprising as different accent patterns are clearly present in declaratives. Wh-intonation of F0 compression yielded a slightly lower rate of accuracy than the condition lacking wh-intonation. This suggests that compressed F0 contours provide rather weak cues for tonal contrast, though the overall effect on perception was minimal. In contrast, considerable confusion is observed with the high plateau pattern, yielding a rate barely above chance for correctly distinguishing the minimal pairs. A one way ANOVA test confirms that the high plateau pattern yields significantly lower percentage of correct perception compared to the other conditions ( $F(2,21)=14.6401$ ,  $p<.0001^*$ ). As the lexi-

cally specified tonal contrast fails to be perceived in the domain of the high plateau, I conclude that the tonal distinction is neutralized when the wh-intonation of the high plateau overrides it.

Given these observations, in the following section I propose some generalizations about the patterns of prosodic scope marking in the three languages.

## 5. Typological Generalizations about the Prosodic *wh*-scope Marking

As shown in the previous sections, the phonetic realization of wh-intonation is determined by the accent of the accompanying wh-phrases. Recall that wh-intonation surfaces as F0 compression in TJ, where wh-phrases bear a falling tone, whereas it surfaces as a high plateau in FJ, where wh-phrases exhibit a rising tone in wh-interrogatives. The accent alternation of particular wh-phrases in SKK sheds further light on the striking effect of tonal type on the implementation of wh-intonation. Theoretically, this observation suggests that the information of a wh-phrase and its accents must be available at the interface of syntax and prosody.

Also, integrating the characteristics of wh-intonation in the languages suggests that prosodic scope marking in question modifies phonological phrasing, requiring a wh-phrase and its associated Comp to be contained in a single prosodic phrase. The view accounting for wh-intonation in TJ as local F0 compression alone does not capture the global effect of the intonation patterns and, further, it is difficult to extend this analysis into the closely related languages. I conclude that this type of prosodic scope marking modifies phonological phrasing, following Hirotsu (2005) and Richard (2006). The modification of phrasing surfaces as local F0 compression in certain languages and as a high plateau in others. Yet, without specifying its level, I refer to the phrase formed for marking wh-scope as a phonological phrase, as the phonetic implementation of wh-intonation is distinct among the languages.<sup>7</sup>

Given the typological generalizations above, I would like to propose phonological representations for the tone-determined prosodic scope marking in these languages. Representations for the two patterns are given in (11). Phrase boundaries are indicated by parentheses. A falling tone is represented as H\*+L following the representation of accented items in TJ. Also, the trailing tone of a rising accent is considered to be a phrasal tone marked by +H. I

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<sup>7</sup> Ito and Mester (2007) propose that a MaP and a MiP are the same prosodic category used in a recursive structure.



encountered inside the *wh*-domain, and an F0 rise and compression are observed (Kubo 1993, HK Hwang 2006). For FJ, however, Kubo (p.c.) observes that the high plateau pattern is preserved even when focus is assigned inside the domain. More detailed examination is required for the issue of the interaction between *wh* and focus.

## 6. Conclusion

In this paper, I have reviewed previous research and issues regarding the prosodic marking of the semantic scope of *wh*-phrases in TJ, FJ and SKK. In particular, this study notably expands and solidifies the discussion of the phenomenon with experimental data on the phonetic implementation of *wh*-intonation in FJ and SKK.

The prosodic marking of *wh*-scope in these languages comprises a special prosodic contour that forms a phonological phrase corresponding to the scope of a *wh*-phrase. Its left edge is aligned with the *wh*-phrase, and its right edge is aligned with the *Comp*, over which the *wh*-phrase takes scope.

In FJ and SKK, the phonetic encoding of *wh*-intonation and focus is distinct. The prosodic marking of *wh*-scope in these dialects exhibits a high flat F0 contour with lexical pitch accent deletion occurring for all of the material inside the domain. Impressionistic observations of deaccenting in SKK receives experimental support from the results of a perception test, which reveals that lexical pitch accents are not contrastive inside the domain of the high plateau.

In TJ, *wh*-intonation exhibits the F0 excursion expansion of a *wh*-phrase and the F0 compression of the post-*wh* material. Studies solely on TJ assume that the prosodic pattern of *wh*-interrogatives and the prosody invoked by focus are equivalent based on the phonetic similarity between the two. Yet, the exceptional implementation of *wh*-intonation in SKK and FJ highlights the fact that focus intonation and the intonation pattern of *wh*-interrogatives in those languages are distinct.

Though the high plateau pattern is dominant for prosodic scope marking in SKK, some *wh*-phrases exhibit alternating tone patterns resulting in distinct realizations of *wh*-intonation. Specifically, a rising tone of a *wh*-phrase yields the high plateau pattern with a neutralization of tonal contrast, whereas a falling tone results in the F0 compression pattern for scope marking. The correlation between the accent types of *wh*-phrases and the phonetic implementation of *wh*-intonation has a theoretical implication that the information of *wh*-phrases should be accessible to the interface between prosody and syntax. Given the observations addressed in this study, I proposed typological generalizations and phonological representations for the

prosodic wh-scope marking in question.

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